BULLETINS
OF
AMERICAN PALEONTOLOGY

Vol. 11

No. 46

VENEZUELAN DEVONIAN FOSSILS

(Presented to the Graduate School of Cornell University in partial fulfillment of the requirements for the degree of Master of Arts)

By

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December 9, 1926

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INTRODUCTION AND ACKNOWLEDGMENTS

Although Mesozoic and Cenozoic deposits are well represented in northern Venezuela, knowledge of Paleozoic history has hitherto been quite obscure. Rather recently, however, and mainly through the efforts of Mr. Charles W. Yeakel, a collection of Devonian fossils was secured near the headwaters of the Cachiri River in the northwestern part of Venezuela near the Colombian border. Inasmuch as the literature is nearly barren of information concerning these older deposits, this provides a comparatively new field of investigation in Venezuela for Paleozoic sedimentation.

That the Devonian series were found in place I am assured by various investigators, though I am informed in a communication from Mr. Liddle, who accompanied Mr. Yeakel, that the majority of our fossils were collected from float, and that many of the specimens are from the shale phases in the series. A number of the specimens are in a fairly good state of preservation, but often the inaccessibility of the cardinal areas and other diagnostic parts, whose characters define criteria for identification, prevents precise determination. There is some variation in the rock matrix containing the fossils and in the absence of any notes relative to the stratigraphic succession of the beds, I cannot be assured of the homogeneity of the entire fauna, though as a general statement it seems reasonable to assert that the fossils show closest relationships to upper lower and lower middle Devonian species from the type localities of eastern United States.

The types of rock represented are:

1. A gray, fine-grained sandstone, containing fine flakes of mica and occasional patches of bright brown iron stains.
2. A dirty gray, rather compact shale, weathered to a dull brown color with numerous Bryozoa.
3. A gray-black, semi-crystalline limestone.

These various rocks are all fossiliferous, and the fact that the lithological characters of some tend to grade into that of the others, together with the occurrence of some of the same species in the different matrices, warrants the temporary assumption that the beds may be considered as a stratigraphic unit. In addition to the above named rocks, a few fragments of a hard, rather coarse-grained, metamorphosed sandstone are included in the collection, but it contains very few specifically identifiable forms. In the paleontological discussion, the type of rock in which each species occurs will be noted.

To Prof. Harris of Cornell University, for whose interest and co-operation I have always been indebted, I tender my sincerest gratitude. I am also under obilgations to Mr. J. E. Brantly and Mr. C. R. Rider of the Venezuelan Atlantic Refining Company for their many kindnesses in facilitating the shipment of the fossils to me and for permission to publish this article. And finally to Mr. Yeakel, whose loss is keenly felt by all who knew him, we offer our belated appreciation.

DESCRIPTION OF SPECIES

COELENTERATA

ANTHOZOA

Cyathophyllum venezuelense, n. sp. Pl. 1, Figs. 1–5

Corallum simple, varying somewhat in outline. Some specimens are sub-cylindric, curved, elongated, while others are broadly conical in shape. The more elongate specimens bear slight circular irregularities or swellings at distant intervals; epitheca thin; calice ovate, circular, or elliptical, probably with a moderately deep cavity, the depth of which cannot be ascertained on our specimens because of adhering material; septa rather numerous, varying with the size of the calix, almost equal, straight or slightly bent, extending nearly to the center where they twist together to produce the appearance of a pseudo-columella. A longitudinal section shows that the tabulæ are quite prominent, their proximity to each other varying in different specimens. The distance between septa in vertical section averages slightly less than a millimeter.

Dimensions:

Alt. 105 mm., diam. of calice 50 mm.
Alt. 55 mm., diam. of calice 46 mm.
Alt. 45 mm., diam. of calice 32 mm.; 25 mm.

In many respects this species is rather closely akin to *C. pocillum* Davis from the middle Devonian of Kentucky. One specimen suggests a relationship to the *C. zenkeri* Billings from the Onondaga formation of New York, while *C. robustum* and *C. galerum* Hall from the Hamilton formation of western New York also exhibit similarities. Despite this seeming relationship to middle Devonian forms, there are also a number of lower Devonian corals, especially from Kentucky, that are not unlike this in their characters.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Diphyphyllum vermetum, n. sp. Pl. 1, Figs. 6, 7; Pl. 2, Fig. 1

This species virtually comprises the limestone in which it is found imbedded. Coralla occurring in clusters, but as far as observed they are simple and not branching, subvermiculate in appearance, with numerous growth lines and irregular constrictions and swellings of low relief; longitudinal sculpture consisting of rather numerous septal furrows; longitudinal sections show the visceral chambers crossed by subequally spaced tabulæ; calyx probably shallow.

Dimensions. Diameter of average corallum 4–6 mm.

There seems to be no alliance between this species and any hitherto described from South America, though in North America the form *D. verneuilanum* from the middle Devonian has a suggestive relationship. From the latter, the present species is distinguished in the smaller size of the coralla.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Pleurodictyum venezuelense, n. sp. Pl. 1, Figs. 8, 9

Corallum massive, rather small, subhemispherical, the upper surface somewhat unevenly convex, the under side slightly concave; in the superficial characters of the exterior it resembles *Favosites forbesi* of England, but differs in its internal composition. In polished section, the center of the base presents an irregular, undefined mass, recrystallized by secondary calcite which seems to indicate that the corallum may have been attached to some foreign body during life. Before polishing the base it was seen to have a thin epitheca, but so weathered as to obscure its structure; corallites polygonal, in close contact throughout, not surrounded by thickened margins; septa fairly numerous, about 35 on our specimen, which in longitudinal section diverge somewhat and rather frequently bifurcate; tabulæ faintly displayed, extending across the visceral chambers, sometimes slightly flexuous, at other times straight, but not vesicular in character; mural pores small, arranged in a single irregular row upon each of the prismatic faces of the corallites.

Dimensions. Long diameter of corallum, 26 mm.; short diameter, 16 mm.

I am not entirely satisfied with the generic determination of this form, though its characteristics indicate a Favositic relationship.

Specifically, this tabulate coral seems not unlike the Argentinian *Pleurodictyum* sp. Thomas (Zeit. Deut. Geol. Gesell., Vol. 57, p. 267, pl. 12, figs. 21, a, 1905) from the beds at Cerro del Fuerte, but neither the description nor figure of his poorly preserved form warrant accurate comparison. The Brazilian *P. amazonicum* Katzer (Geol. Unt. Amazon., p. 192, pl. 2, figs. I-Id, 1903) has larger *Michelinia*-like calices. The shape of the corallum of *Favosites argentina* Thomas (op. cit., p. 268, pl. 12, figs. 20, a, b, and plate accompanying p. 268, 1905) is quite unlike this species, though *F. forbesi,* with which Thomas compared his form, is much more alike, the present species differing in its septal arrangement. *Michelinia transitoria* Knod (N. Jahr. f. Min., Geol. u. Pal., Beil. Bd. 25, p. 561, pl. 30, figs. 1–4, 1908) from the Icla beds of Bolivia is another South American species, but here again the Venezuelan form is at variance in the chaarcters of the septa and in its smaller corallites.

The small size of the calices distinguish this species from such Devonian forms as the Hamiltonian *P. stylophorum* Eaton, and *P. problematicum* Goldfuss from the Coblentzian of the Rhine region and Onondaga of Illinois (Meek and Worther).

Occurrence. In the limestone series.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

MOLLUSCOIDEA

BRYOZOA

Fenestella venezuelensis n. sp. Pl. 2, Figs. 2, 3

Zoarium a somewhat undulating flabellate expansion;

fronds large, compact; branches very slender, ridge-shaped, gently curved, bifurcating at distant intervals; dissepiments short, horizontal or arched, from half to less than half the width of the branches. Zoecia in two ranges. Fenestrules tabulate, rectangular, about 20 in one centimeter, the measurements taken in the direction of the longer axes; cell apertures, as indicated by the filling of the cells, somewhat irregular in shape, about three to each fenestrule; the non-celluliferous faces of the fronds have a fibrous structure composing the more solid portions of the branches, and these branches are occasionally nodose, and carinated.

Dimensions. A fairly complete frond measures 50 mm. in altitude and 30 mm. in width.

This species closely resembles the Upper Heldebergian (Onondaga) *F. parallela* Hall (Geol. Sur. N. Y., Vol. 6, p. 107, pl. 44, figs. 8–18, 1887) from the vicinity of Buffalo, N. Y., and may subsequently prove to be identical, but in the absence of branches showing the celluliferous faces intact, and in the occasional nodosity of the non-celluliferous faces (which feature is not mentioned or figured by Hall) it seems advisable to consider this as new. In his list of fossils from the Devonian of Curua, Brazil, Katzer mentions the presence of *F. parallela* but does not figure it, though it is probably a very similar species to the present one described.

Occurrence. In the gray shale. Occasional impressions of a similar or identical form is also found in the dark-gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Polypora cachirita n. sp. Pl. 2, Figs. 4–6

Occurs with the preceding and differentiated from it by its broader branches and with a gerater number of ranges of cell apertures; zoarium an undulating expansion, infundibuliform, fronds large; branches strong, angular and generally carinate, with an average width of .6 of a millimeter; bifurcations distant. Interstices slightly wider than the branches. Dissepiments somewhat narrower than the branches. Fenestrules subquadrangular to subovate; cell apertures usually in three to five ranges as indicated by the fillings impressed on occasional specimens. There are about nine fenestrules in the length of one centimeter.

Dimensions. An incomplete portion of a frond measures 40 mm. in altitude and about 20 mm. in width.

This species suggests a relationship to a number of Onondaga *Polyporid* forms in western New York, of which we may cite *P. robusta* Hall as a typical representative (Geol. Sur. N. Y., Vol. 6, p. 156, pl. 34, figs. 4–7, 1887). Not unlike this in all probability is a specifically unidentified *Fenestella* recorded by Katzer (Bol. Mus. Paraense, Vol. 2, p. 210, 1897–98) as an impression in the Devonian rocks of the Maecurú River of Brazil, which he says is somewhat of the same type as *P. cultella* Hall. This is of the same group as *robusta* previously mentioned above.

Occurrence. In the gray shale. The cell impressions have afforded easy access of weathering agents and hence many of the specimens are largely stained with iron.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

BRACHIOPODA

Dalmanella (?) venezuelensis n. sp. Pl. 2, Fig. 7

Shell quite small, suborbicular. Cardinal angles rounded. Greatest width of shell somewhat greater than length of the hinge-line. Beak small, projecting slightly above the cardinal area. Dorsal valve from which the specimen is described is depressed-convex, with a shallow mesial depression extending the length of the shell, rapidly widening anteriorly. Surface covered by 24 strong longitudinal riblets.

Dimensions. Alt. 5 mm., long. 6 mm.

The generic position of this species is doubtful. The form is characterized by its broadly circular outline and unusually strong ribbing. It is somewhat the same type of shall as *Orthis ?* sp. Reed (Ann. S. Afr. Mus., Vol. 4, p. 175, pl. 21, fig. 6, 1908) from the Bokkeveld beds of Africa, but differs in its broader medial sinus and short, straighter hinge-line, though from Reed's figure it would appear as if the Bokkeveld shell were weathered posteriorly, hence accounting for the apparently sloping hinge-line.

Occurrence. In the gray, micaceous, fine-grained sandstone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Stropheodonta (Leptostrophia) caribbeana n. sp. Pl. 3, Fig. 1

Shell semi-elliptical; pedicle valve slightly inflated, the maximum inflation coming at the umbos; length somewhat less than the width; hinge-line equal to the width of the shell below; anterior margin well rounded, the lateral margins nearly straight; cardinal angles sub-acute; beak appressed, scarcely rising above the hinge-line.

The surface is covered with a series of fine, unequal, radiating threads, gently undulating, increasing by bifurcation, and crossed by fine, even, concentric striæ; in addition there are about 16 subregular, concentric undulations which follow the outline of the valve; these are weaker at the apex but become more prominent anteriorly. Of the fine, radial riblets there are about two hundred in number. Dorsal valve partially and obscurely represented.

Dimensions. Alt. 24 mm., long. 31 mm.

To South American species, this is closest perhaps to *S. argentinus* Thomas (Zeit. Deut. Geol. Gesell., Vol. 57, p. 261, pl. 13, figs. 27, 28, a, 1905) from Cerro del Fuerte; the latter differs in its weaker concentric undulations, and in its rather pronounced anterior genuflection, though this may have been caused by distortion. This is also like the form Knod referred to as *S. perplanas* (probably not of Conrad) from the Icla and *Conularia* beds of Bolivia (N. Jahr. f. Min., Geol. u. Pal., Beil. Bd. 25, p. 540, pl. 27, fig. 4, 1908) but here again the strong concentric undulations are wanting; the Bolivian form is also more finely ribbed. Nevertheless the relationship is very close, as is that of *Strophomena* sp. Ulrich also from Bolivia, which Knod considers syonymous with his *S. perplana.* In North America this species stands intermediate between the Lower Heldebergian *S. becki* Hall and the typical Hamiltonian *S. perplana* (Conrad). The concentric undulations are very similar to those on *becki,* but the latter has coarser radial striæ than has the Venezuelan species. To *perplana* this exhibits a striking resemblance, but the North American form is generally less strongly undulate and with somewhat finer radial striæ. Still, the Venezuelan species may be particularly well developed in its sculptural details and a more complete suite of specimens might prove it to be identical with forms of *perplana.* In South Africa, *S.* cf. *concinna* (Morris and Sharp) reported by Reed, is a similar species but lacks the undulations of the surface.

Occurrence. In the gray weathered shale. The dark gray limestone also has a form that may be the brachial valve of this species.

Locality. Upper course of the Cachiri River.

Type. Cornell University Paleontological Laboratory.

Stropheodonta zuliana n. sp. Pl. 2, Fig. 8

Species represented by several external molds of the brachial valve; shell rather small, nearly flat, hemispheral, with a well rounded anterior margin and straight hingeline having the full width of the shell; cardinal area very narrow; sculpture consisting of a series of distant, subregular, rather fine, elevated filiform striæ, between which are still finer threads with an occasional coarser one. The major radii are more pronounced in the center of the valve than laterally, especially near the hinge where they become obsolete.

Dimensions. Alt. 6 mm., long. 9 mm.

This very pretty species at once recalls the Oriskanian *Brachyprion majus* Clarke from Becraft Mountain, N. Y. (See Mem. N. Y. State Mus., No. 3, Vol. 3, p. 56, pl. 8, figs. 1–7, 1900). Comparison with the brachial valve, however, recalls that the Oriskanian species is more elongate than the Venezuelan shell, and considerably larger. Occasional forms of *Leptostrophia interstrialis* (Vanuxem) of the Portage (Upper Devonian) are not unlike this species as illustrated in the Maryland Geological Survey Report, p. 554, pl. 48, fig. 7, 1913.

Occurrence. In the gray, fine-grained, micaceous, sandstone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Schuchertella (?) sp. aff. **sullivani** (Morris and Sharpe) Pl.3 , Fig. 2

Orthis Sullivani Morris and Sharpe. Quart. Journ. Geol. Soc. London, Vol. 2, p. 275, pl. 10, fiig. 1, 1846.

Strophomena sullivani Sharpe. Trans. Geol. Soc. London, Vol. 7, p. 209, pl. 26, figs. 18, 19, 1856.

Strophomena sullivani Reed. Ann. S. Afr. Mus., Vol. 4, p. 170, pl. 20, fig. 8, 1903.

Schuchertella sullivani Clarke. Foss. Dev. Parana, p. 279, pl. 23, figs. 16–23, 1913.

A fragment of the basal part of a large subovate form closely resembles the above named species in the character of its ribbing. *S. sullivani* has been reported from the Falkland Islands, the Bokkeveld beds of South Africa and from Paraná, Brazil.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimen. Cornell University Paleontological Laboratory.

Chonetes (?) zuliensis n. sp. P l. 3, Fig. 3

Shell small, subelliptical, wider than high; hinge-line straight, equal to or greater than the width of the shell below; cardinal angles subacute, anterior margin well rounded; pedicle valve very convex umbonally, flattening somewhat toward the front; umbos broad and full, beaks projecting slightly over the hinge line, the spines of which are obscured (if any). Surface ornamented with about twenty-five strong, subequal, radiating ribs which seem to increase by bifurcation. The ribs are high, subangular, separated by well channeeld interspaces. Careful inspection reveals in addition a very fine series of concentric growth striæ. Dorsal valve missing.

Dimensions. Alt. 7.5 mm., long. 10 mm.

This rather scantily ribbed form very strongly suggests a more than casual relationship to *Chonetes stubeli* Ulrich [1] from the sandstone of the Rio Sicasica between Oruro and La Paz, Bolivia. Both Ulrich's description and figure of the species, however, show a medial sinus on the pedicle valve, which is lacking on the present species. The convexity of the Venezuelan form is also greater than that of the Bolivian but in other respects the two are nearly identical. From the Bokkeveld beds of Africa, Reed's *C.* aff. *settiger* [2] Hall, is also allied to *zuliensis,* but here again the presence of a median depression and less gibbosity of the pedicle valve serve to temporarily differentiate the two. The South African form also has a few more ribs than our shell. With the exception of its somewhat greater number of ribs, Reed's species compares very favorably with Ulrich's.

In Brazil, the Erere sandstone produces a small *Chonetes,* named *herbert-smithi* [3] which is not unlike *zuliensis,* but is more finely ribbed and less robust. Clarke's figure 4, pl. 24, of *Chonetes falklandicus* (Dev. Foss. Parana, 1913) is very much like the present shell except for its more numerous ribs, but I am not prepared to call the Venezuelan species *falklandicus*, for even though it is much like one of the varietal phases of what Clarke interpreted as *falklandicus*, it is clearly different than the original portrayal of that species by Morris and Shape. True, there may be the gradations from finely to coarsely ribbed forms of *falklandicus*, but in the absence of intergrading shells of the Venezuelan species I proposed for ours the new name *zuliensis*. Haug (Doc. Scientifiques Saharienne, pl. 14, figs. 4, 5, *partim*, 1905) has figured an unnamed form on a slab of rock also containing *Stropheodonta* (*Leptostrophia*) *oriskania* Clarke from the lower ? Devonian sandstone of Tassili which superficially compares favorably with this species.

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[1] N. Jahr. f. Min., Geol. u. Pal., Beil. Bd. 8, p. 80, pl. 5, figs. 3, 4, 1902.

[2] Ann. S. Afr. Mus., Vol. 4, p. 174, pl. 21, figs. 4, 5, 1908.

[3] Bull. Buff. Soc. Nat. Hist., Vol. 1, p. 251, pl. 10, figs. 39–42; 44–47, 1874.

Occurrence. In the gray to black limestone and in the gray, weathered shale.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Chonetes venezuelensis n. sp. Pl. 3, Figs. 4, 5, 6, 7, 8 ?

Shell of medium size, hemispherical in outline, with evenly rounded margins and straight hinge line equal to the width of the shell below or slightly shorter; cardinal extremities obtusely angular; pedicle valve strongly convex, with or without a slight medial depression; the beak rises barely above the hinge-line, is small and appressed; hinge area very narrow. The sculpture consists of about eighty radial riblets, subequal to equal in size, separated by interspaces equally as wide. Where a portion of the original shell has been retained at the sides, the intercostal spaces are observed to be punctate, while the ribs, which reflect the sculpture of the interior of the valve, are with small spicules. The punctations and spinosities are better developed laterally than centrally; cardinal spines of hinge-line obscured, if any are present. Brachial valve nearly flat with a slight central inflation which is barely sulcate. An impression of the internal mold shows the ribs to bear small spines as on the opposite valve.

Dimensions. Alt. 14 mm., diam. 17.5 mm.

It seems probable that the specimens figured as *C.* cf. *coronatus* Conrad by Reed (Ann. S. Afr. Mus., Vol. 4, p. 172, pl. 20, figs. 11, 12; pl. 21, 1908) is somewhat similar to our species. The Venezuelan form, however, is much more nearly allied to the species Reed has doubtfully referred to as *coronatus* than to typical forms of *coronatus* from New York which are accessible to me for comparison. Fig. 8, pl. 3 shows a slightly distorted mold with a medial incision suggesting the characters of *Eodevonaria.* I am not sure, however, that the specimen represents this species.

Occurrence. In the gray, fine-grained, micaceous sandstone. A similar form also occurs both in the limestone and shale but their identification is uncertain.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Chonetes (Eodevonaria) subhemispherica n. sp. Pl. 3, Figs. 9; 10 ?

Shell semi-elliptical to semi-circular. Ventral valve extremely gibbous, especially below the beak; anterior margin well rounded; hinge-line straight, apparently denticulate on the external border; umbo more or less gibbous, beak appressed and incurved. Dorsal (?) valve (Fig. --) nearly flat, with a medial elevated rib extending from the beak down the center of the valve. External border of hinge clearly crenulate.

Surface marked by about fifty low, equal, evenly rounded riblets, crossed perhaps by concentric striations which are not clearly visible on the specimen. There seems to be a tendency for the extremities of the hinge-line to become extended or auriculate.

Dimensions. Ventral valve, alt. 14 mm., long. 16 mm.

This species shows unmistakable affinities to the Oriskanian and Onondagan *C. hemispherica* and *C. arcuata* Hall, though it is somewhat smaller than mature specimens of these two forms. The presence of the genus *Eodevonaria* is rather good evidence of the upper lower or lower middle position of the Venezuelan Devonian.

Occurrence. In the dark gray to black limestone. The dorsal valve of what seems to be this species is found in the gray shale.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Conchidium (?) sp. indet. Pl. 3, Fig. 11

General characteristics as figured. The valve is strongly convex, and ornamented with a series of strong, elevated plications which become nearly obsolete laterally. Below the umbo, some concentric wrinkles suggest the assumption that the radial plications are crossed by rather strong concentric striations. A rather wide sulcus appears umbonally but the appearance may be deceptive due to crushing of the valve. Cardinal area partially weathered and obscured on one side of the beak and broken on the other making even the generic identification doubtful.

Dimensions. Alt. 29. mm., long. 34 mm.

Occurrence. In the dark gray limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Amphigenia (?) sp. indet. Pl. 4, Fig. 1

The umbonal portion of a large species is very doubtfully referred to this genus. The partial contour of the shell indicates that it is probably triangularly elliptical in outline. Beak low, appressed; cardinal margins sloping rather acutely from the beak and making an angle of about 120 degrees with each other. The ventral (?) valve is strongly convex, especially umbonally where it is subangularly elevated into a rather high, rounded prominence. Although this eminence continues with undiminished strength to the anterior portion of our specimen, it probably becomes depressed anteriorly on a complete shell. Cardinal area obscured by adhering material, but rather broad for the genus. The surface is marked by rather distant concentric weak lamellæ which are broadly V-shaped, and a series of radiating riblets which are just barely discernible on our specimen.

Dimensions. Alt. ?, long. 50 mm.

This very interesting shell very unfortunately has the cardinal area partially broken and obscured, hence making the generic determination extremely doubtful. From the general contour of the cardinal area, it would seem entirely too broad for the genus, but the characteristic angulation of the valve, and the radial ribbing (unfortunately nearly all weathered) suggests a *Rensselarid* relationship of the form. We await better material for more accurate identification.

Atrypa cf. **reticularis** (Linne) Pl. 4, Figs. 2, 3

Anomia reticularis Linne. Syst. Nat., ed. 12, p. 1132, 1767.
Terebratula reticularis De Verneuil. Geol. of Russia and Ural Mts., Vol. 2, pl. 10, fig. 12, 1845.
Atrypa reticularis Morris. Cat. British Fossils, p. 132, 1854.
Atrypa reticularis Hall. Nat. Hist. N. Y., Vol. 4, pt. 1, p. 316, pls. 51–53a, 1867.
Atrypa reticularis Schuchert. Bull. 87, U. S. G. S., p. 154, 1897. See also for complete bibliography up to 1897.
Atrypa reticularis Weller. Geol. Surv. N. J., Vol. 3, p. 236, pl. 21, figs. 35–37, 1903.
Atrypa reticularis Schuchert and Maynard. Md. Geol. Surv., p. 392, pl. 67, figs. 26–28, 1913.

Venezuelan shells rather large, subcircular; pedicle valve moderately gibbous about the umbo, depressed anteriorly; cardinal angles well rounded; beak fairly prominent, rising somewhat above the hinge; Brachial (?) valve similar to the preceding but somewhat less inflated. Surface of valves marked by coarse, subequal, radiating riblets, of which there are about five to five millimeters at the base of the shell. These are somewhat rounded and separated by interspaces of nearly equal width. Though not distinctly shown, the valves are crossed by concentric, lamellose extensions of the shell which have been partially obliterated by weathering. Interior of valves inacessible.

Dimensions. Alt. 32 mm., long. 35 mm. Alt. 36 mm., long. 39 mm.

Curiously enough, this is the first time this widespread and cosmopolitan species has been recorded from South America, and is as yet unknown in the Bokkeveld beds of South Africa as far as I am aware. Our specimens, though somewhat the worse for wear, appear to be the normal type of *reticularis,* but in the absence of stronger sculptural details and with the interior inaccessible, identity with the above is provisional. Geographically and stratigraphically, this form is known for its efflorescence. Ranging from England, the Continent, North and now South America, with a vertical span from Silurian to uppermost Devonian (Chemung), this species is of little value in discriminating horizons.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimen. Cornell University Paleontological Laboratory.

Spirifer meridioamericana n. sp. Pl. 4, Figs. 4, 5

This species is represented by a poorly preserved ventral valve and a fragment of another specimen which shows to better advantage the sculpture of the form. Shell of medium size, transversely subelliptical, rather compressed; beak fairly high, prominent, but small and slightly incurved; anterior margin of the valve broadly rounded; cardinal margins concavely sloping from the beak; cardinal angles rounded; sinus shallow but well defined, broadening anteriorly. The major radial plications are relatively low, rounded, broad, about five or six in number, decreasing in prominence from the sinus to the periphery. On the more complete specimen which seems to be fairly mature, a series of fine, but rather strong striæ longitudinally traverse the valve and are interrupted occasionally by small nodular growths. In addition to these secondary threads, numerous, fine, concentric growth lines cross the valve.

The sculpture on the fragment is as follows: (1) a number of strong, radial undulations like those described above; (2) these major plications are crossed by widely spaced, overlapping, concentric lamellæ, and (3) a finer series of concentric growth striæ; (4) on the lamellae are a number of elongated pustules or spiny processes. Although these latter radial lineations are disconnected from those on the lamella above they are in alignment, and it seems probable that it is the growth of these that form the secondary radial lines observed on the larger specimen.

Dimensions. Alt. 15 mm., long. 23 mm.

This is a very interesting species, and I am by no means satisfied that my diagnosis is entirely correct, having to reconstruct the whole from unsatisfactory fragments. It is apparently of much the same type as *S. kayserianus* Clarke (Foss. Dev. Paraná, p. 252, pl. 19, figs. 1–15, 1913) from Brazil, a species which presents numerous different aspects, depending upon its stage of growth.

Occurrence. In the gray weathered shale.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Museum.

Spirifer venezuelensis n. sp. Pl. 4, Fig. 6

Shell transversely subelliptical, of medium size, moderately gibbous, with a straight hinge-line which represents the greatest width of the shell. Ventral valve (from which this species is described) inflated centrally, regularly curving to the front and sides; sinus well defined, rather deep and rounded or subangular; beak small but sharp, rather high, somewhat incurved over the narrow cardinal area. Surface marked by five strong plications on either side of the medial sinus; the plications are high, rounded, separated by narrow interspaces, and become weaker laterally; these are crossed by imbricating lamellose striæ rather closely spaced and studded with very fine, sometimes slightly vermicular lines, arranged in parallel bands according to the distance of the concentric lamellæ. The sculpture is very similar to that of *Reticularia fimbriata* (Conrad) from the Hamilton formation of North America, but the shape of the shell and strong longitudinal folds serve to differentiate the South American species.

Dimensions. Alt 16 mm., long. 19 mm.

This beautifully sculptured species may be identical with the previous form, but it seems advisable to consider them distinct for the present. Strikingly similar in sculptural details is the Eifelian *S. aculeatus* of Europe.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Spirifer audaculus zulianus n. subspecies

Pl. 4, Figs. 7, 8; Pl. 5, Figs. 1–8

The most characteristic form of the Venezuelan Devonian in our collection is a species very closely allied to the *S. audaculus,macronata* type of shell from the middle Devonian deposits of eastern United States.

Ventral valve larger and deeper than the dorsal, with a high, prominent, slightly incurved beak. Cardinal area high, triangular, slightly concave, divided in the middle by a deltoid fissure which is twice as high as wide, and reaches the apex of the area. Cardinal line straight; mesial sinus rather wide, of moderate depth, widening fairly rapidly from the apex to the anterior margin, and generally rounded. Cardinal margins obtusely sloping from the beak.

Dorsal valve less convex than the pedicle valve and not as high; beak small, appressed, and slightly incurved; area obscured but probably linear. Mesial fold well defined, convex, rounded on top (sometimes angular), rapidly expanding from the apex.

Sculpture of both valves consisting of an average of about twenty to thirty equal plications on each half of the valve, rounded, separated by narrow interspaces, and probably crossed by numerous growth striæ which are not visible on the specimen. Both valves are occasionally interrupted by heavier concentric growth bands.

Dimensions. Ventral valve: alt. 31 mm., long. 46 mm; alt of cardinal area 15 mm. Dorsal valve of another specimen: alt. 30 mm., long. 58 mm.

This species closely resembles the Marcellus to Hamiltonian *S. audaculus* Conrad, and indeed some of the dorsal valves are practically identical. The ventral valves of the Venezuelan specimens, however, have a somewhat higher cardinal area and slightly less incurved beak than the typical *audaculus*. Nevertheless there are varietal forms of the latter with high areas that are closely allied to the present species such as the form known as the variety *eatoni*. In the height of its cardinal area our form recalls such species as *S. manni* and *S. granulosus* but the fewer ribs of the latter two forms, and the bipartite mesial fold of *granulosus* serve to differentiate them.

Figure 7, Plate 5, shows a form which apparently grades into this species, but also resembles the Brazilian *S. pedroanus* Hartt and Rathbun from the Erere Devonian of Brazil. Of *pedroanus*, Rathbun (Bull. Buff. Soc. Nat. Hist., Vol. 1, p. 237, pl. 8, figs. 1–9, 13, 14, 16–20, 1974) writes this interesting conclusion: "Prof. Hall, who examined a small number of specimens of this species of Spirifer after the above description was written, thinks that in its different varieties it is very closely related to several American Devonian Spiriferæ; *S. varicosus,* Corniferous limestone; *S. medialis* (*audaculus*) Hamilton group, which varies much in form; *S. angusta,* Hamilton group, perhaps only a variety or young form of *S. medialis;* and *S. macrus* of the Corniferous limestone, which last species, however, has generally a narrower and more curved hinge area. *S. pedroanus,* therefore, appears almost like a connecting link, uniting the above named species in a single series."

Occurrence. In the dark gray to black limestone; in the gray micaceous sandstone; and possibly in the weathered shale.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Spirifer sp. indet. Pl. 3, Fig. 12

General features as figured. The obliteration of the sculptural details does not allow specific characterization.

Dimensions. Alt. 14 mm., long. 22 mm. (approximation).

Unlike the majority of the other forms, this shell occurs in the metamorphosed sandstone.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimen. Cornell University Paleontological Laboratory.

Vitulina (?) venezuelensis n. sp. Pl. 5, Figs. 9–13

This very interesting little species does not adequately fit into any well known genus of Brachiopod, and may possibly be a new genus, in which case I propose the new name of *Venezuelia.* In its general aspects it appears to belong to the *Coelospiridæ* showing affinities to such genera as *Leptocoelia* and *Anoplotheca,* though its straight hinge-line more strongly suggests *Vitulina.* Here again, however, the character of the ribbing is somewhat discrepant and makes reference to that genus temporary.

The form is relatively abundant but is represented in the collection only by pedicle valves. These vary in gibbosity, some being very ventricose, others less so. The shells are generally hemispherical in outline with well rounded anterior margins, and relatively long, straight hinge-lines; cardinal margins depressed; umbos generally full, beaks small. Surface marked with eight to eleven strong, rather distant, angular plications. There is generally one medial plication, flanked by others of equal size, which play out rather sharply toward the lateral margins; concentric lamellæ and a few unusually strong concentric riblets traverse the radial ribs. The pustular markings characteristic of the genus may be present but have not been observed.

Dimensions. Alt. 6.5 mm., long. 7.5 mm.

This species is quite different from the well known North and South American *V. pustulosa* or *Leptocoelia flabellites.* It is readily recognized by its straight hinge, heavy radial and centrally located ribs, and strong concentric sculpture.

Occurrence. In the gray, micaceous, fine-grained sandstone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Athyris aff. **spiriferoides** (Eaton) Pl. 6, Fig. 1

Terebratula spiriferoides Eaton. Amer. Journ. Sci., Vol. 21, p. 137, 1831.

Spirifera spiriferoides Hall. Tenth Rep. N. Y. State Cab. Nat. Hist., p. 153, figs. 1, 2, 1857.

Athyris spiriferoides Hall. Pal. N. Y., Vol. 4, pt. 1, p. 285, pl. 46, figs. 5–31, 1867.

Athyris spiriferoides Schuchert. Bull. 87, U. S. G. S., p. 149, 1897.

Athyris spiriferoides Schuchert and Maynard. Md. Geol. Surv., p.

211, pl. 21, figs. 1, 2, 1913.

Two shells in our collection may be compared with the common *spiriferoides* of the Onondaga and Hamilton groups of North America. One of our specimens is an extremely broad and somewhat distorted individual but is probably the same species as portrayed in Fig. 1, which is a normal shell. The valve is transversely ovate, well inflated, with a short hinge line and rounded cardinal extremities. Maximum convexity umbonally and medially, the valve exhibiting a tendency to become widely sulcate toward the front. Beak small, somewhat incurved. Surface marked by concentric lamellæ.

Dimensions. Alt. 17 mm., long. 22 mm. Alt. 19 mm., long. 32 mm.

This genus has hitherto been unrecorded from South American Devonian deposits. The species is not unlike *S. fultonensis* (Swallow) which has the same stratigraphic range as *spiriferoides.* The relationships of this Venezuelan shell again show the probable lower middle Devonic affinities of the fauna.

Occurrence. In the gray shale.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimens. Cornell University Paleontological Laboratory.

MOLLUSCA

PELECYPODA

Aviculopecten yeakeli n. sp. Pl. 6, fig. 3

Shell rather large, sub-ovate, slightly oblique, length and height nearly equal; anterior and ventral margins regularly rounded; posterior margin of the disk proper forms a nearly even, oblique line to the beak. Left valve slightly inflated in the umbonal region, flatter ventrally. Hinge-line straight, approximately two-thirds the length of the shell. Umbo slightly elevated, sloping rather abruptly to the wings, the umbonial line forming an angle of somewhat more than ninety degrees; ears unequal, the anterior smaller, the posterior alate and triangular; beak located anterior to the middle of the cardinal line; terminal margins of the ears missing but probably somewhat concave.

Sculpture consisting of about thirty-eight strong, elevated, subtriangular, radiating ribs, subequal in size with perhaps an occasional weaker riblet, separated by equally wide interspaces; on the posterior area of the valve there are about twelve fine, radiating riblets, more closely spaced and less pronounced than those on the disk proper. In addition the valve is crossed by numerous concentric growth striæ, but these are only faintly suggested on the specimen.

Dimensions. Alt. 44 mm., long. 46 mm.

This species is very closely allied to Katzer's *A. coelhoanus* from the "*Spirifer* sandstone" of the Rio Maecuru, Brazil, the latter differentiating primarily in having alternating stronger and finer ribs, and wide, flat interspaces. To *A. pecteniformis* and *A. princeps* (Conrad) the present species shows similar characteristics, but its broadly ovate outline and stronger ribs differentiate it from the aforementioned middle Devonian species of North America.

Named in honor of Mr. C. Wesley Yeakel.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Aviculopecten sp. indet. Pl. 6, Fig. 2

A partial specimen doubtfully referred to *Aviculopecten*, shows surface markings of numerous, subequal, radiating riblets crossed by a series of fine, regular, closely spaced concentric striæ. Characters of the upper portion of the valve not observable. The specimen probably represents an immature shell.

Dimensions. Alt. 9 mm., long. 9 mm. (approximately).

The form appears to be of the same general character as *A. coelhoanus* Katzer (right valve) from the Brazilian Devonian of the Río Maecurú, but is very much smaller.

Occurrence. In the gray weathered shale.

Locality. Upper course of the Cachiri River.

Specimen. Cornell University Paleontological Laboratory.

Conocardium sp. Pl. 6, Figs. 4, 5

Two partial specimens, indicating a shell of generous proportions; is probably subovate-trigonal in outline when complete. Length greater than the height; beak very high, rather narrow, situated on the posterior two-fifths of the valve, and is strongly recurved as well as sharply keeled medially. Posterior area of the shell rather acutely truncated; umbonal slope continuing to the ventral margin; anterior dorsal margin acutely sloping to form the cuneate anterior. Markings consist of unequal to subequal radiating ribs, not clearly defined on our specimens, and numerous, fine, concentric growth striæ.

Probable dimensions. Alt. 50 mm., long. 60 mm.

This genus has hitherto been unrecorded from other Devonian deposits of South America. The obscurity of certain features and distortion of the shell, however, render the determination doubtful.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimen. Cornell University Paleontological Laboratory.

Cypricardinia subindenta n. sp. Pl. 6, Fig. 6

Cypricardinia indenta (Conrad) Hall. Geol. Surv. N. Y., Vol. 5, pt. 1, p. 485, pl. 79, figs. 6–16, 1885.

Specimen small, subrhomboidal in outline, anterior margin sharply rounded, ventral border nearly straight, with a slight sinuosity; posterior extremity acutely curved below, obliquely truncate above. A well defined but rounded umbonal ridge extends from behind the beak to the posterior margin, marking off the post-cardinal depression; dorsal margin straight. Left valve slightly inflated umbonally, flattening out below. Beaks anterior, small, appressed, probably rising slightly above the hinge-line. Sculpture consisting of about ten or twelve rather distant, concentric undulations, which, anterior to the middle of the valve, curve slightly toward the umbo, and which follow the contour of the valve's outline on the depressed area behind; though not distinctly visible on the specimen, a series of finer concentric striæ occur between the major undulations; some oblique radial markings are also barely discernible.

Dimensions. Alt. 6.5 mm., long. 9.5 mm.

In many particulars this shell closely resembles *C. indenta* Conrad which ranges from the Oriskanian to Hamiltonian horizons in North America. Characteristic of the latter species, however, is its chevron-like sculpture visible under conditions of suitable preservation; although the South American form shows some indistinct radial markings, which may suggest the ornamentation of *indenta,* they are not clear enough to warrant positive comparison with the North American species, and hence I suggest the name *subindenta* until a later collection affords better material for comparison. Though Clarke's *Macrodon ?* sp. from Paraná (Foss. Dev. Paraná, p. 184, pl. 16, fig. 8, 1913) has fewer major undulations, is more visibly depressed centrally and has a less oblique posterior margin, the natural variability of such a form as this, may indicate a closer relationship to our form than comparison of only one shell indicates.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

GASTEROPODA

Diaphorostoma neveritanum n. sp. Pl. 6, Fig. 7; Pl. 7, Figs. 1–3

Shell subovate, globose, rather large, naticoid in outline;

spire slightly elevated, obtuse; sutures linear, weakly incised; whorls about four, convex, increasing rapidly in size, the apical volution seemingly papilliform; body whorl globose, convex laterally but with an apparent slight flattening below the suture on what would ordinarily correspond to the shoulder of the whorl; aperture nearly ovate, large; columellar lip thickened and folded, and seemingly reflexed over the umbilicus which is closed to view.

Surface marked by a series of fine, subequal, flexuous, longutudinal, thread-like striæ, much like those often occurring on the genus *Pleurotomaria*, and in addition crossed by equally fine, but perhaps slightly wider spaced revolving lines giving a beautiful reticulate appearance to the whorls. This latticed sculpture is observable on the less weathered portions of the shell, the longitudinal markings being otherwise the more prominent; as the longitudinal striæ leave the suture they are curved convexly toward the aperture, but upon approaching the madial portion of the body whorl they are flexed rather sharply inward, again suggesting a relationship to the sculpture of *Pleurotomaria*. The species, then, is at once distinguished by its *Neverita*-like shape, obtuse spire, globose whorls, reticulate sculpture and ovate aperture.

Dimensions. Alt. 32 mm., diam. 30 mm.

In affinities, the species is most nearly related to the Oriskanian *D. desmatum* Clarke of eastern United States, the latter differing, however, in its shorter and wider body whorl. The sculpture of the two forms, on the other hand, is very similar. In shape, the present species would appear somewhat allied to *Holopea furmaniana* Hartt and Rathbun from the Ereré Devonian of Pará, Brazil, but the diagnosis "surface as determined by external molds, smooth," of that species does not harmonize with the latticed ornamentation of the Venezuelan species. Examination of the type specimens of *furmaniana* show also that the shape of the shell is discrepant from that of our species. *Littorina ?* (*Holopea*) *bainii* Sharpe from the Devonian of

South Africa is higher and more prominently spired. In Argentina, a weathered *Naticopsis ?* sp. Kayser, is a form of this type of shell. From Pebble Island, West Falkland, Clarke's *D. allardycei,* though of the same order, is a less compact and less prominently reticulate species.

In many characteristics this form is also like *Pleurotomaria keyseri* Ulrich from the *Conularia* beds of Bolivia, but the latter has a rather angulate body whorl with a narrow circumventing band. Finally, there is a suggestion of similarity to *Platyostoma lineatum* (Conrad) which ranges from the Onondaga formation to the Chemung in New York, but *lineata* differs in being more finely sculptured.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

Pleurotomaria venezuelensis n. sp. Pl. 7, Figs. 4, 5

Shell poorly preserved and somewhat distorted, depressed-trochiform; spire probably moderately elevated, but subdued in this particular specimen; apex small. Volutions about five, depressed-convex on the upper side; last whorl ventricose and angulate; sutures incised, but probably not as much as the weathered specimen indicates; surface ornamentation very obscure, but there seems to be a narrow peipheral sulcus on the spire whorls at the sutures; the penultimate whorl shows a slight revolving sulcus medially, but this, however, is obsolete on the other whorls and may simply represent an irregularity in the shell. There are evidences, nevertheless, of regular, rather strong radiating striæ visible near the sutures, which bend back at the angulation of the whorl.

Body volution with a rather large, subcircular and deep umbilicus underneath; aperture subquadrate.

Dimensions. Alt. 13 mm., diam. 22 mm.

There is much to be desired in the description of the species, but it seems advisable to include any generically recognizable forms in a treatise dealing with a new area.

Occurrence. In the gray, fine-grained, micaceous sandstone.

Locality. Upper course of the Cachiri River, State of Zulia.

Type. Cornell University Paleontological Laboratory.

ARTHROPODA

Phacops argentinus ? Thomas. Pl. 7, Figs. 6, 7

Phacops cf. *rana* Kayser. Zeit. Deut. Geol. Gesell., Vol. 49, p. 284, pl. 11, figs. 8–10, 1897.

Phacops argentinus Thomas. Ibid, Vol. 57, p. 246, pl. 11, figs. 8–9b, 1905.

A coiled form showing some of the thoracic segments and the pygidium appears to be closely allied to *argentinus*, though the imperfect preservation and absence of parts of both this and the Argentine specimens do not assure undoubted identity. Discussing the characteristics of his species, Thomas mentions the pentahedral shape of the glabella, the well developed and projecting eyes, and the subtriangular shape of the pygidium with its six segments on the axis and on the sides.

Unfortunately the cephalic portion of the Venezuelan specimen is missing; the thorax shows about seven segments, which on the moderately broad, gently arched axis are rather strongly elevated, of moderate width, separated by well channeled furrows and firmly anchylosed with the pleura by articulations visible on the peeled carapace; dorsal furrows not as pronounced as the distortion of the specimen indicates; pleural areas somewhat wider than the axis; the maximum width of the thorax comes at the fourth or fifth segment from the pygidium.

Pygidium subtriangular, rather short and of moderate breadth, with a characteristic narrow, depressed-convex, rather rapidly tapering axis, sculptured with about six or seven segments, of which the anterior four are the more prominent, the posterior members being indistinctly developed; pleura broad, convex, carrying about seven segments, the upper four well defined, flattened, rather broad, and separated by narrow sulci, the remaining smaller, narrower and indistinctly divided; border narrow and flat.

Dimensions. Probable length of specimen 25 mm., diam. 18 mm. Pygidium, length 7 mm., width 14 mm.

The thorax and pygidium of this species is similar to that of a number of *Phacopidæ,* and this taken in conjunction with the absence of the cephalon, makes differentiation difficult. To *P. rana* Green (Onondaga and Hamilton of North America) this form shows a striking similarity and indeed it was originally referred to it by Kayser (op. cit.); Thomas, however, recognizes that *argentinus* has the frontal part of the glabella flatter, but I cannot attest to this difference because of the absence of the glabella on my single specimen. At present it seems best to separate *argentinus* from *rana* until more complete specimens are available, though it is interesting to note that Groth (Bull. Geol. Soc. France, (4), Vol. 12, p. 607, pl. 19, figs. 2, 2a, 1912) has referred to *Phacops* from the Icla beds of Bolivia to *rana.* Other allied species are *P. latifrons* Bronn from the Eifelian of Europe. This form has also been reported by Salter from Oruro, Bolivia, but Thomas conjectures it may be his *argentinus. P. africanus* Salter (*pars*) as figured by Lake differs in its much broader pygidial axis, as does *P. scirpeus* Clarke from the Rio Macurú, Brazil. Again, as far as the parts are comparable, the Venezuelan species is similar to the Oriskanian *P. logani* of North America. In its affinities, then, it would seem to appertain to the upper lower or middle Devonian series of rocks.

Occurrence. In the dark gray to black limestone.

Locality. Upper course of the Cachiri River, State of Zulia.

Specimen. Cornell University Paleontological Laboratory.

CONCLUSIONS

That the Venezuelan fossils have a Devonic expression seem unmistakable, though at present it is somewhat premature, with the limited number of forms we have studied, to state definitely with what known horizon they may be correlatable. Considering the fossils as a whole, however, and assuming the homogeneity of the fauna despits its occurrence in somewhat varying rock matrices, it would seem as if the stratigraphic position of the beds ought to come between the Oriskanian and Onondagan formations as known from the type section in New York. Of the ascertained relationships with described species whose stratigraphic range is known, our fauna shows that the greater number of species are related to Onondaga forms, a somewhat smaller have both Oriskanian and Onondagan affinities, while a few are akin to Hamiltonian species.

The Corals, *Cyathophyllum venezuelense* and *Diphyphyllum vermetum*, exhibit resemblance to known forms in the middle Devonian beds of eastern United States. The tabulate *Pleurodictyum venezuelense* contributes nothing definite toward ascertaining the age of our fauna, but the Bryozoa *Fenestella venezuelensis* and *Polypora cachirita* which occur abundantly in the shale phase of the series, seem to be strongly suggestive of the Onondaga formation, the former being nearly identical with *F. parallela* Hall, the latter representing the *P. robusta* type. In the Brachiopods, *Leptostrophia caribbeana* seems to lies between the Heldebergian *becki* and the Hamiltonian *perplana*, while *Stropheodonta zulianum* seems to be akin to *Brachyprion majus* from the Oriskany of Becraft Mountain, New York. The *Eodevonaria* division of the *Chonetes* group strongly reminds one of such characteristic Oriskany and Onondaga forms as *C. hemispherica* and *C. arcuata* Hall. *Chonetes zuliensis* suggests more than a casual relationship to the Bolivian *C. stubeli* described to be lower-middle Devonian in age. *Atrypa reticularis* is of no diagnostic value because of its great stratigraphic range, but it is of interest in being recorded for the first time in South America, giving it a further known geographical distribution. *Spirifer meridioamericana* and *S. venezuelensis* are fimbriate forms much like *S. kayserianus* Clarke from the Devonian of Paraná, Brazil, and like the Eifelian *S. alculeatus* of Europe. It is in this genus that we get the closest affinity to Hamiltonian species, for *S. audaculus zulianus* is nearly identical with *S. audaculus,* the well known middle Devonian form of eastern United States, *Vitulina* (?) *venezuelensis* is a very distinct form whose relationships have not been ascertained. *Athyris* aff. *spiriferoides* ranges from Onondaga to Hamilton in North America.

The representatives of the Pelecypods are four in number—*Aviculopecten yeakeli* is of the same order as *A. coelhanus* Katzer from the Maecurú beds of Brazil. If the generic determination of *Conocardium* is correct, this will be the first notification of this genus from South America, though the distortion and obscurity of the specimen makes its identification uncertain. The most characteristic of the lamellibranchs, however, is the small *Cypricardinia subindenta* which may subsequently prove to be identical with *C. indenta* (Conrad), a shell which ranges from Oriskanian to Hamiltonian in the United States. Because of the weathering of the sculptural details which prevents close identification, I have deemed it advisable to consider the Venezuelan species temporarily distinct.

The Gasteropod *Diaphorostoma neveritanum* seems to come between the Oriskanian *D. desmatum* Clarke and the middle Devonian *Platyostoma lineatum* (*Conrad*). With its regularly globose body whorl and beautiful sculpture it makes a most outstanding form. *Pleurotomaria venezuelensis* is too poorly preserved for satisfactory comparison.

The single imperfect Trilobite, *Phacops argentinus ?* Thomas has been found in the middle Devonian of Argentina, but the Venezuelan shell awaits better material for more accurate identification.

The facies of the Venezuelan fauna indicates that the deposits are of a marine, littoral type, laid down in warm waters of rather shallow depth. The abundance of Corals and Bryozoa together with the occurrence of certain types of Brachiopods lend themselves to this supposition. Such forms as *Vitulina pustulosa, Tropidoleptus carinatus* and *Leptocoelia flabellites* which are so common in the other Devonian deposits of South America, have not as yet been found, nor have other rather characteristic forms made their appearance, but it is to be hoped that further exploration and collection will afford sufficient material to aid us in correlating the Venezuelan deposits not only with those in North America but with the scattered deposits in South America, and with the Bokkeveld beds of South Africa.

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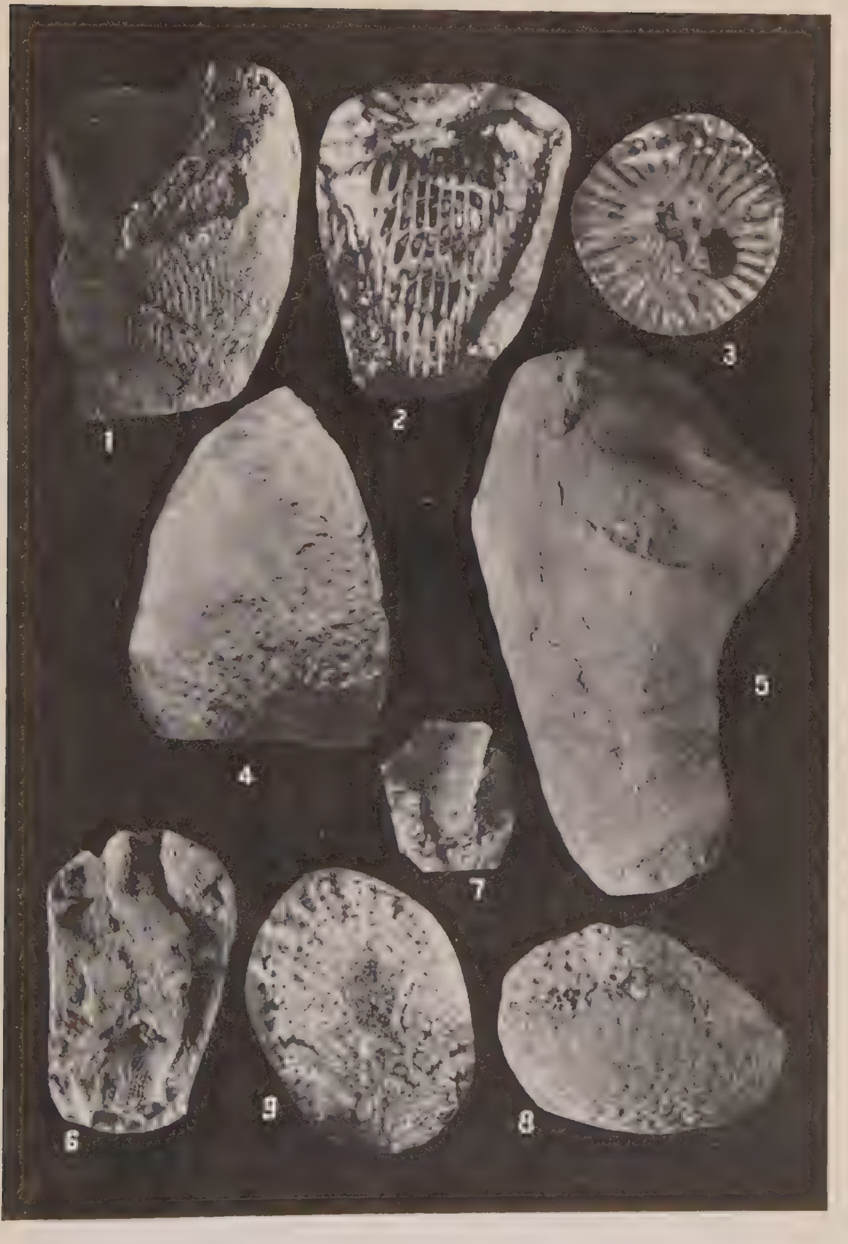
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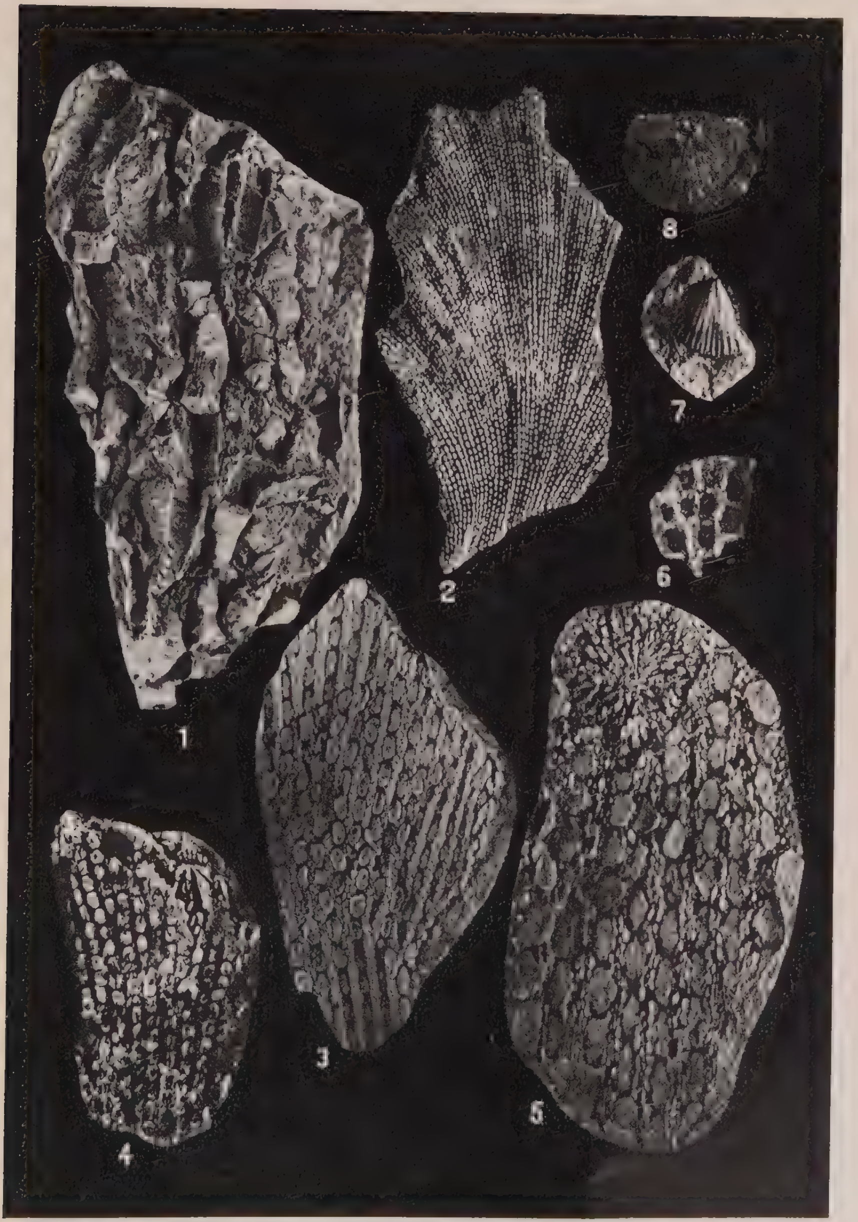
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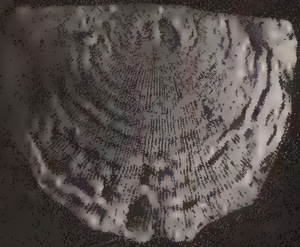
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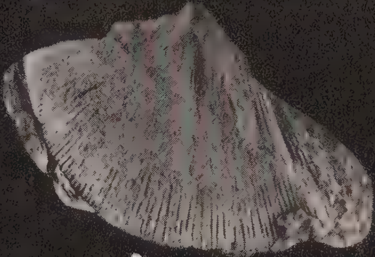
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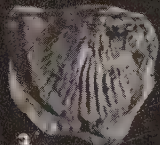
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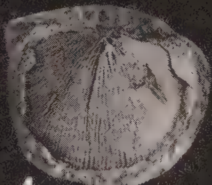
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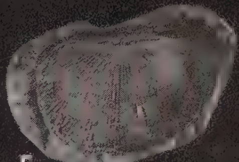
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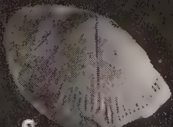
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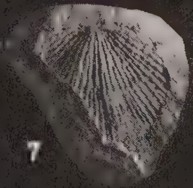
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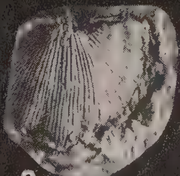
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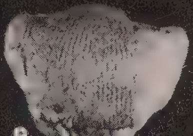
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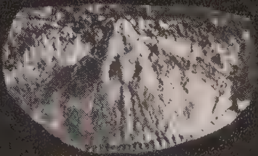
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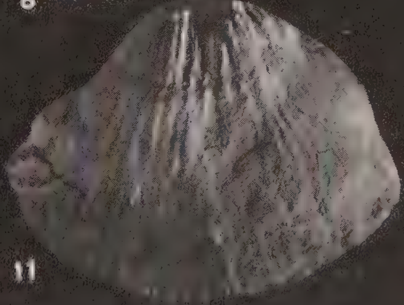
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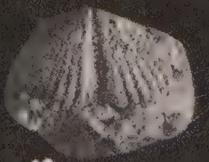
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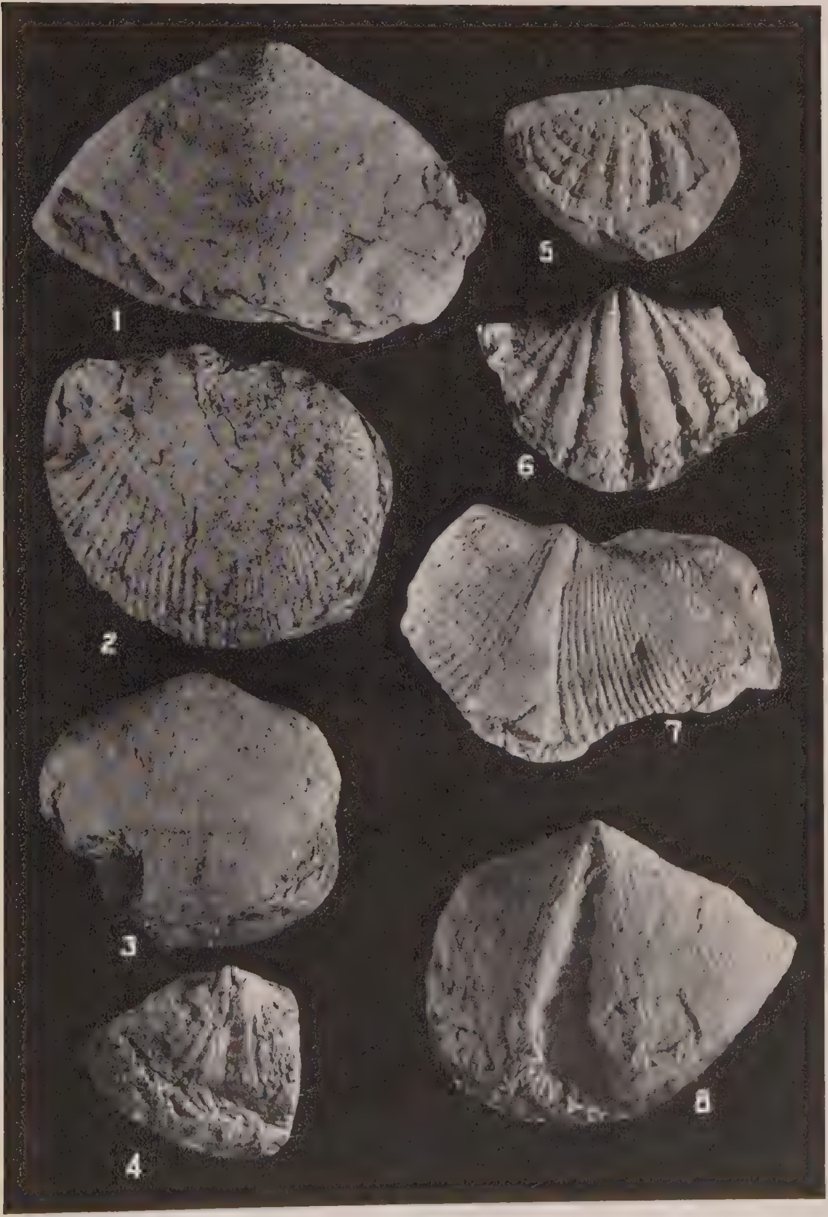
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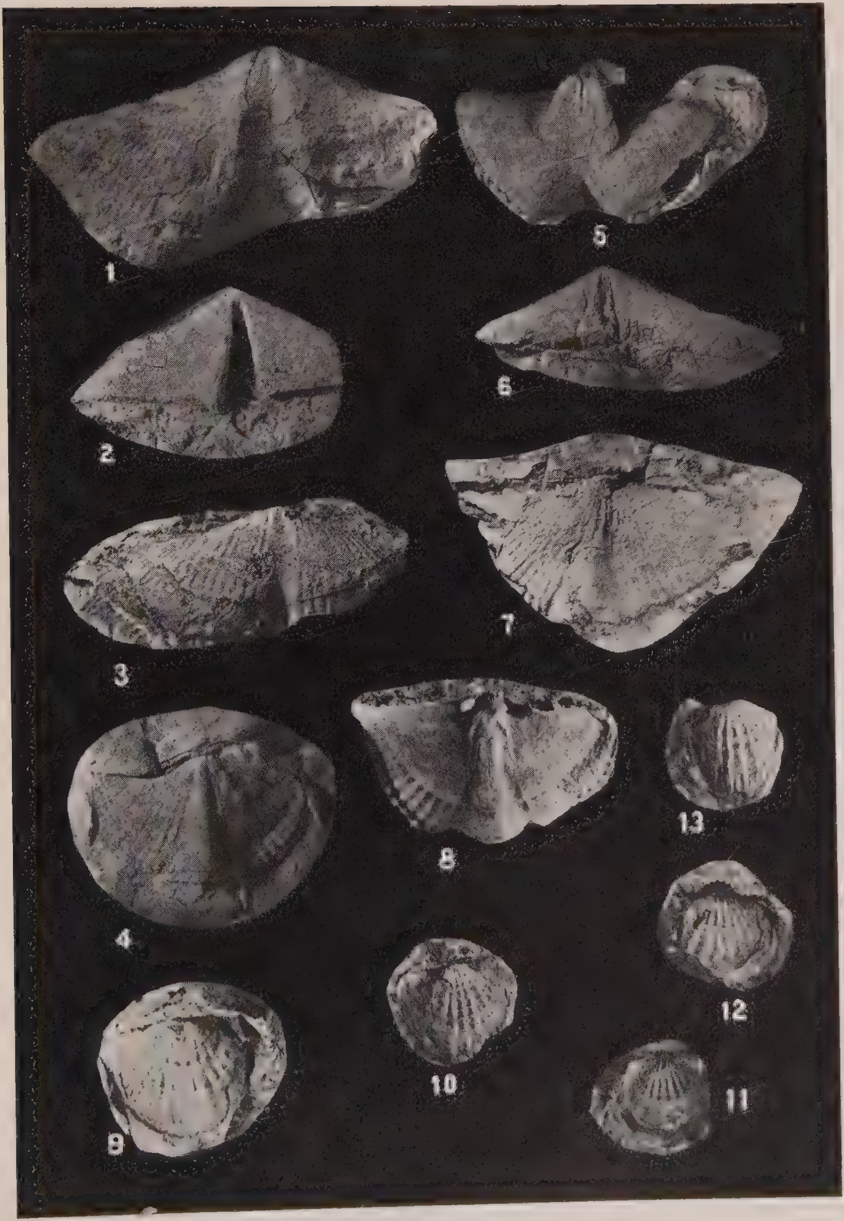
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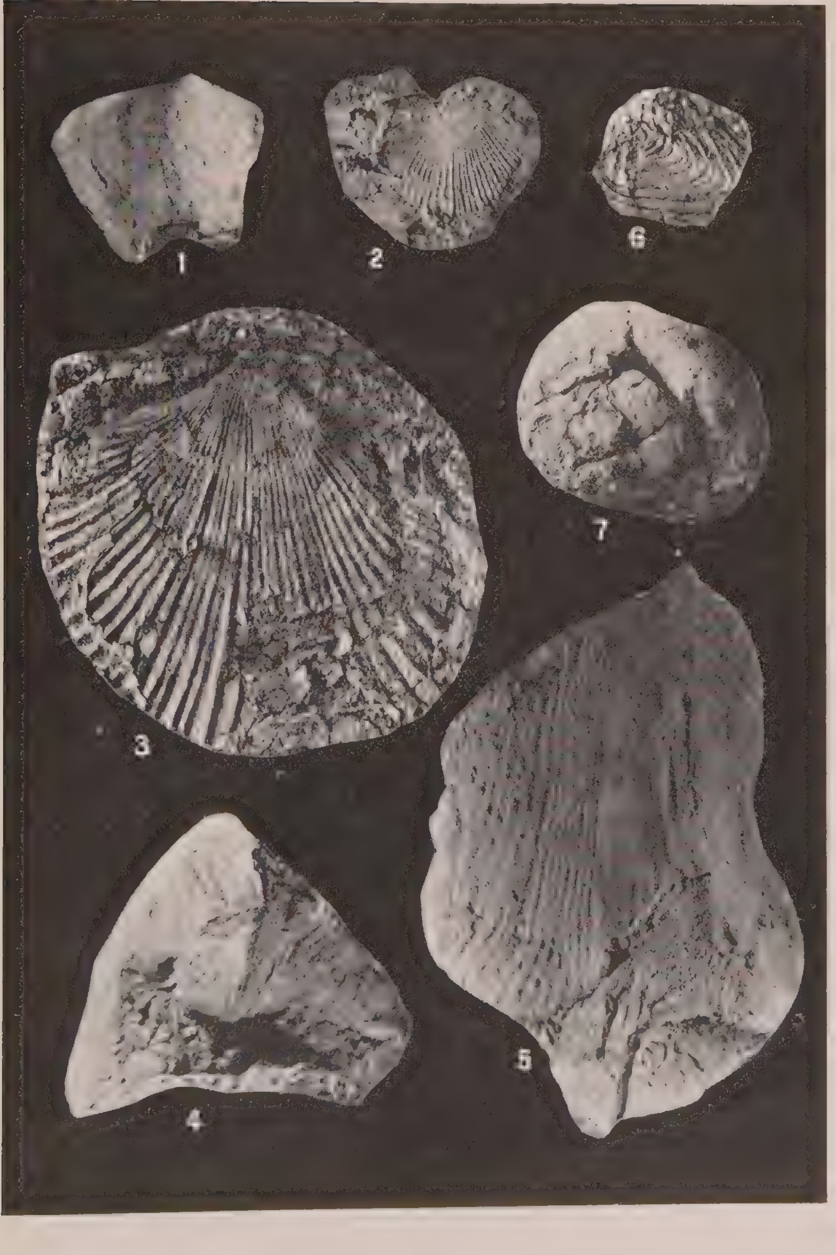
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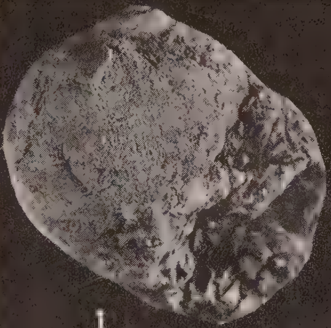
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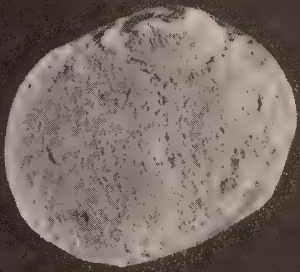
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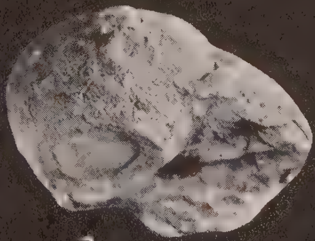
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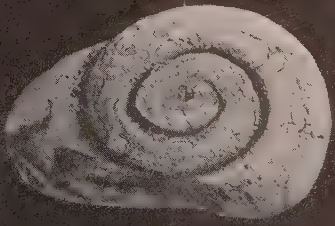
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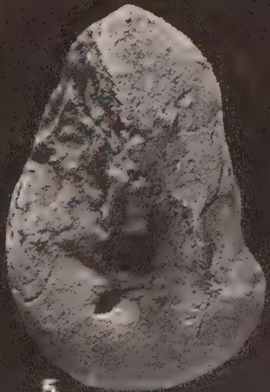
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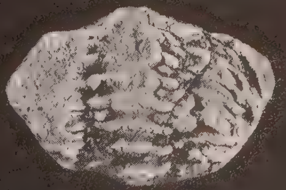
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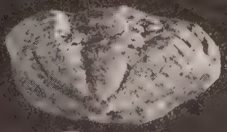
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